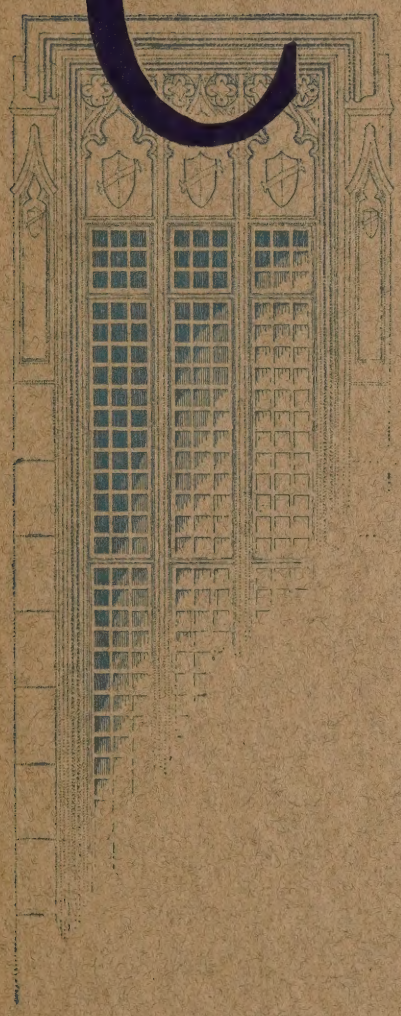
CAST STONE



DETAILS
SPECIFICATIONS
TECHNICAL DATA

A.I.A. File No. 8c.

A WORD ABOUT WHAT IS TO COME

For most building materials, there has been developed a technic of design and use characteristic of each. Such technic is determined by the nature of the material, especially its structural limitations and its limitations as to economical fabricating processes.

Since its beginning, cast stone has been used principally according to methods already established for other materials. It has been required to imitate the appearance of material it displaced. As a result, only superficial use has been made of the properties peculiar to this product.

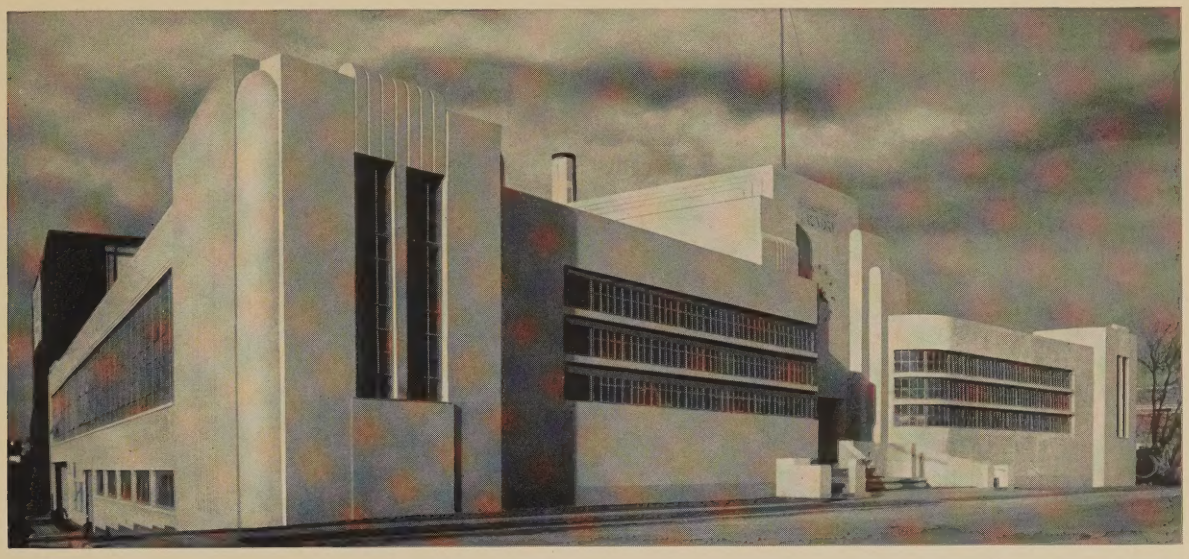
In order to show how cast stone may be utilized to best advantage in its own character, a series of Cast Stone Service Bulletins is being inaugurated. These bulletins will furnish reliable and impartial information on the nature, uses and proper treatment of cast stone. Bulletins will be issued from time to time and will be sent gladly to architects desiring them.

THE CAST STONE INSTITUTE

(American Concrete Institute Tentative Specification P-3-A-29T is printed on the inside back cover)

Details—
Knickerbocker Laundry

BULLETIN
NO. CS-13D
CAST STONE INSTITUTE



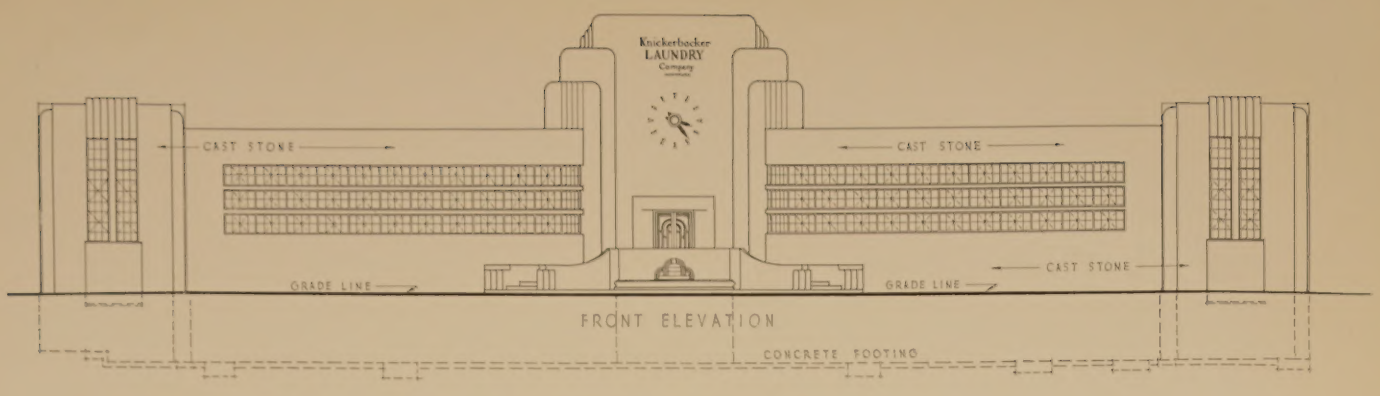
KNICKERBOCKER LAUNDRY COMPANY BUILDING
Long Island City, New York. Irving M. Fenichel, Architect

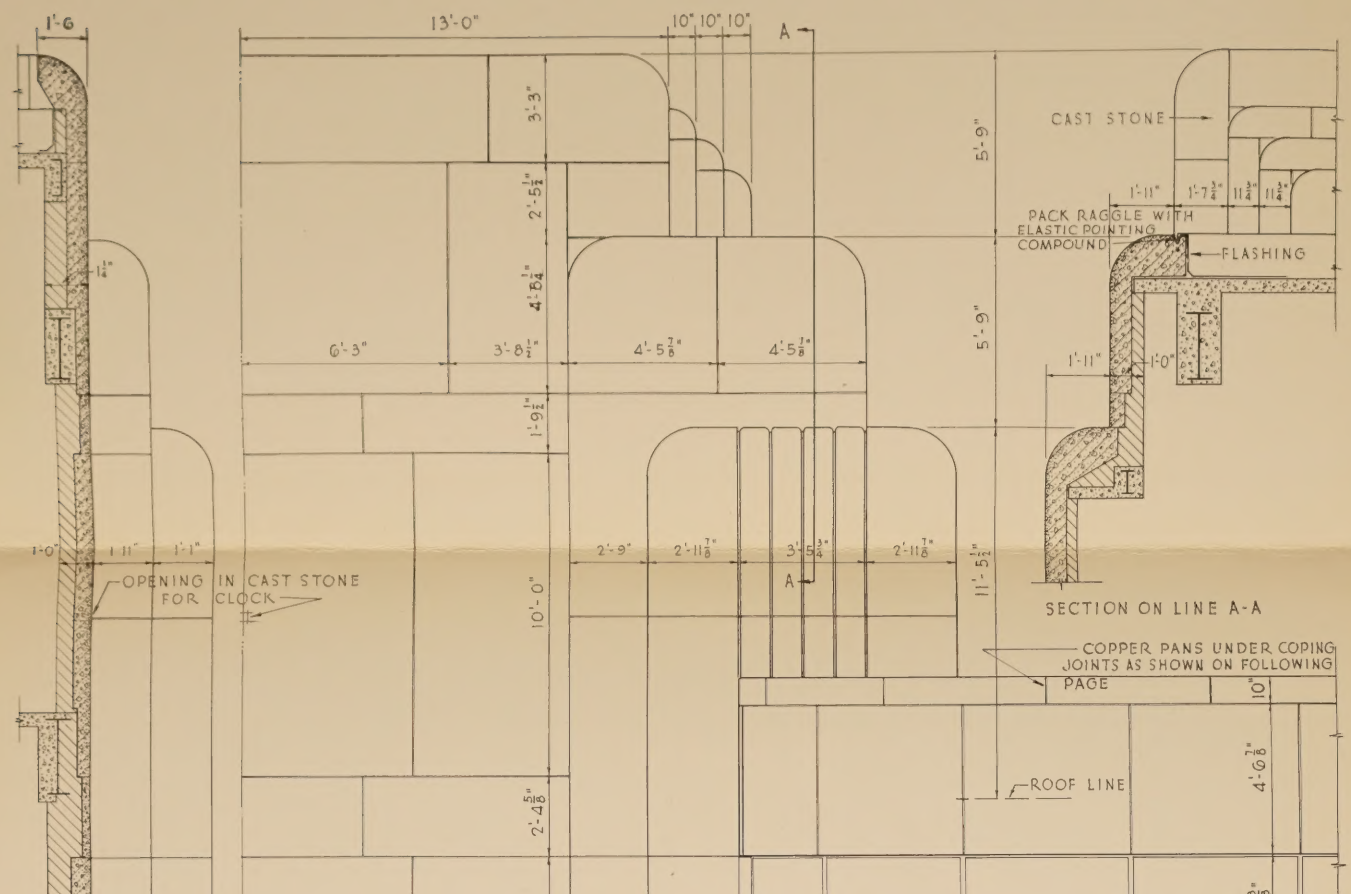
In the design of the Knickerbocker Laundry Company building, Long Island City, Architect Irving Fenichel has skilfully utilized many of the advantages of cast stone.

The curving surfaces and deeply rounded corners, the uniform color and the large slabs so essential to the execution of the design, virtually dictated the choice of cast stone for the work. The cast stone, light buff in color, is made with a hard marble aggregate except in the fountain portion where granite was used.

A study of the details on the following pages will be repaid in knowledge of some of the things which can be done especially well with cast stone.

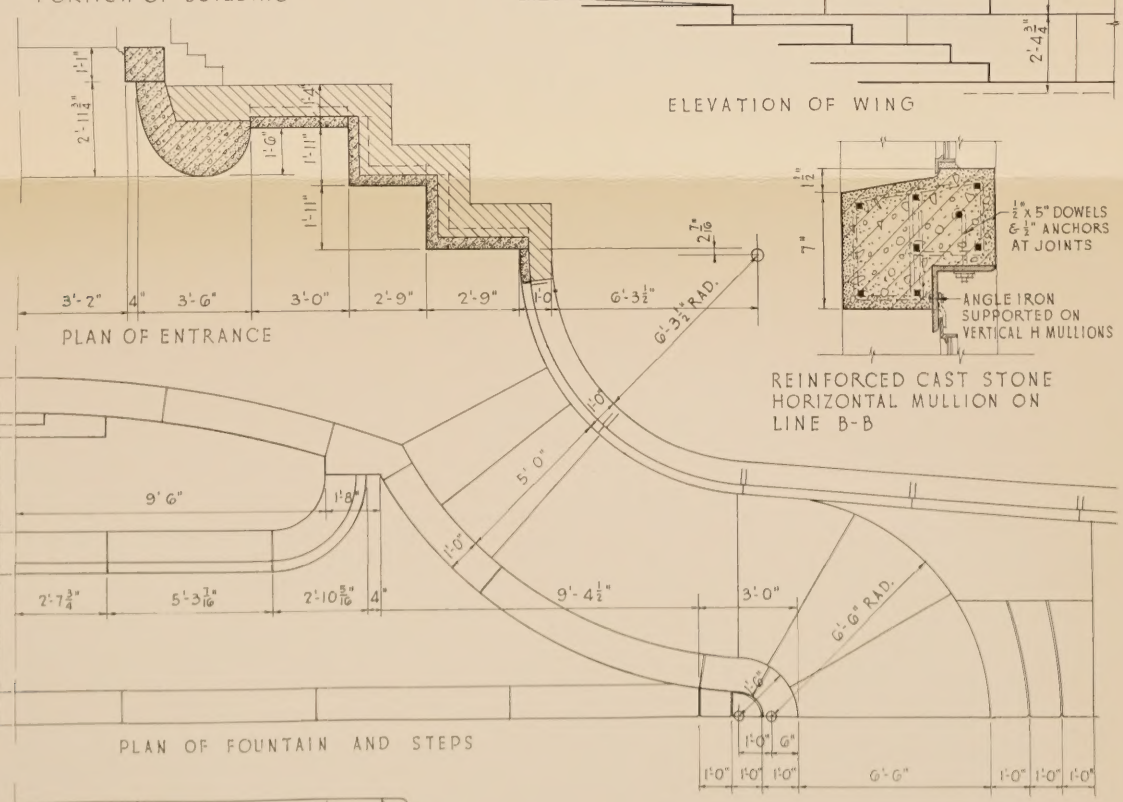
Acknowledgment is given to Mr. Fenichel, not only for this practical example of what might be termed a "cast stone style," but also for his help in supplying information for these details.

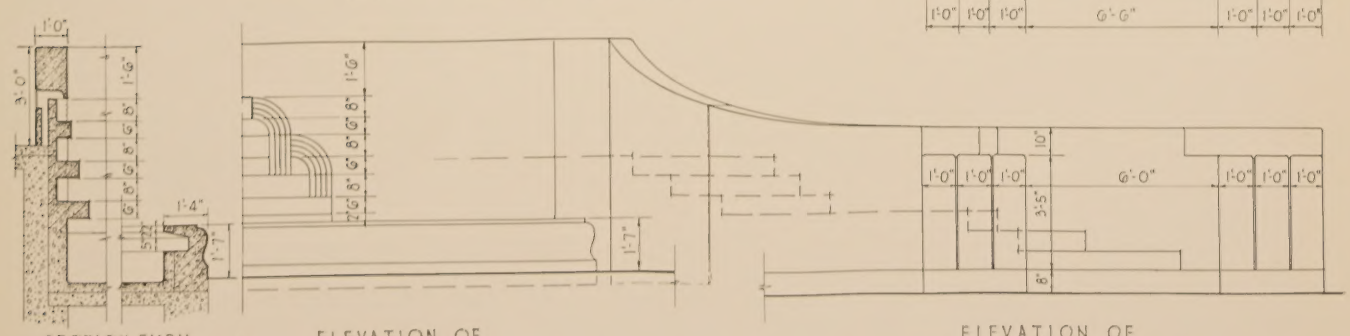


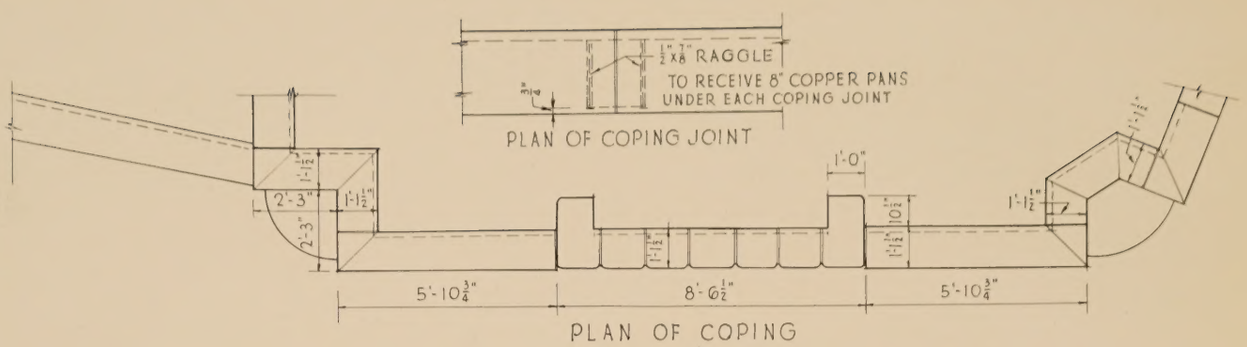


NOTE

ALL CAST STONE PROVIDED WITH ANCHOR LOOPS ON BACK OR ANCHOR HOLES ON EDGES AND REINFORCED WITH RODS OR MESH AS REQUIRED TO CARRY IMPOSED LOADS OR ITS OWN WEIGHT.

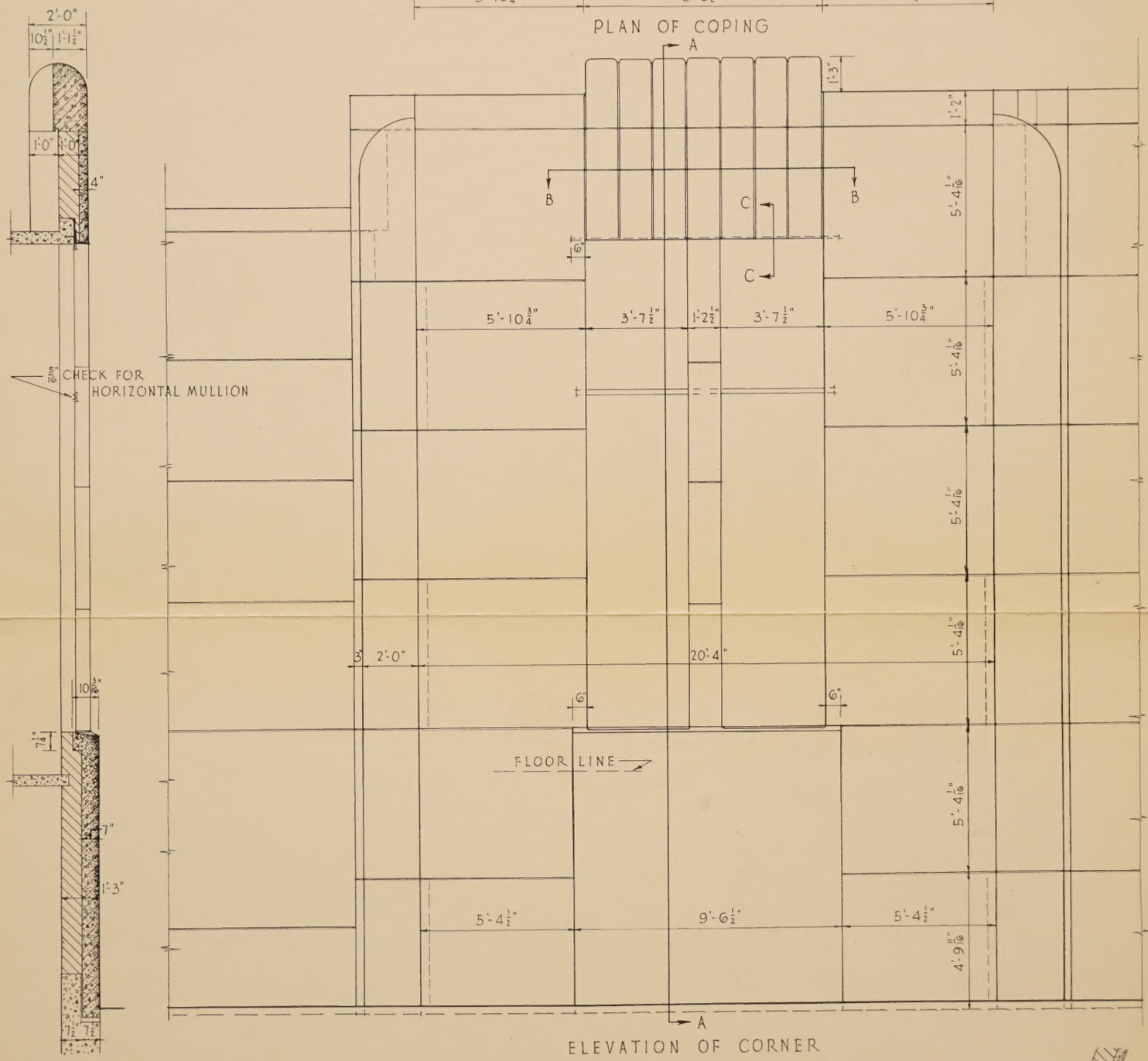






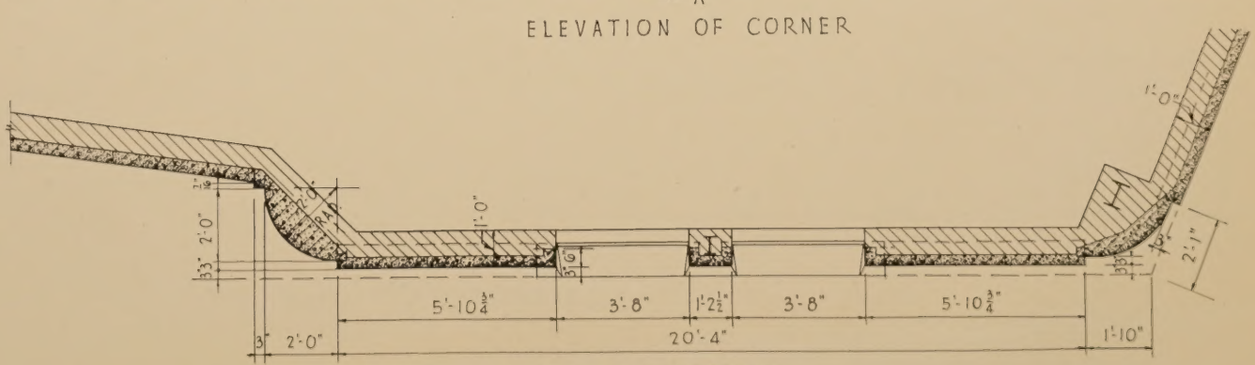
PLAN OF COPING JOINT

PLAN OF COPING

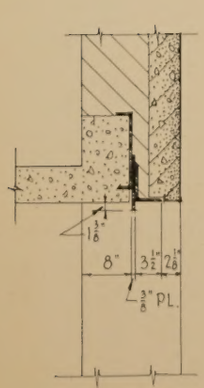


ELEVATION OF CORNER

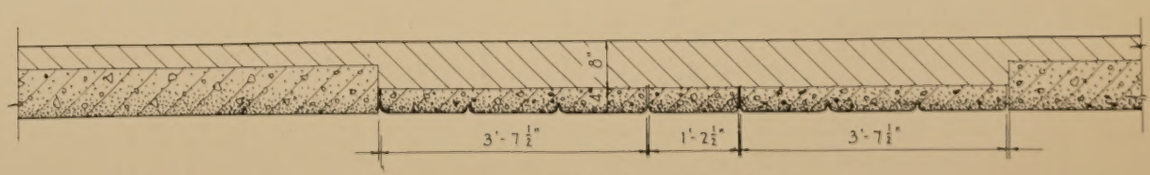
SECTION ON
LINE A-A



PLAN OF CORNER



SECTION ON LINE C-C



PLAN ON LINE B-B

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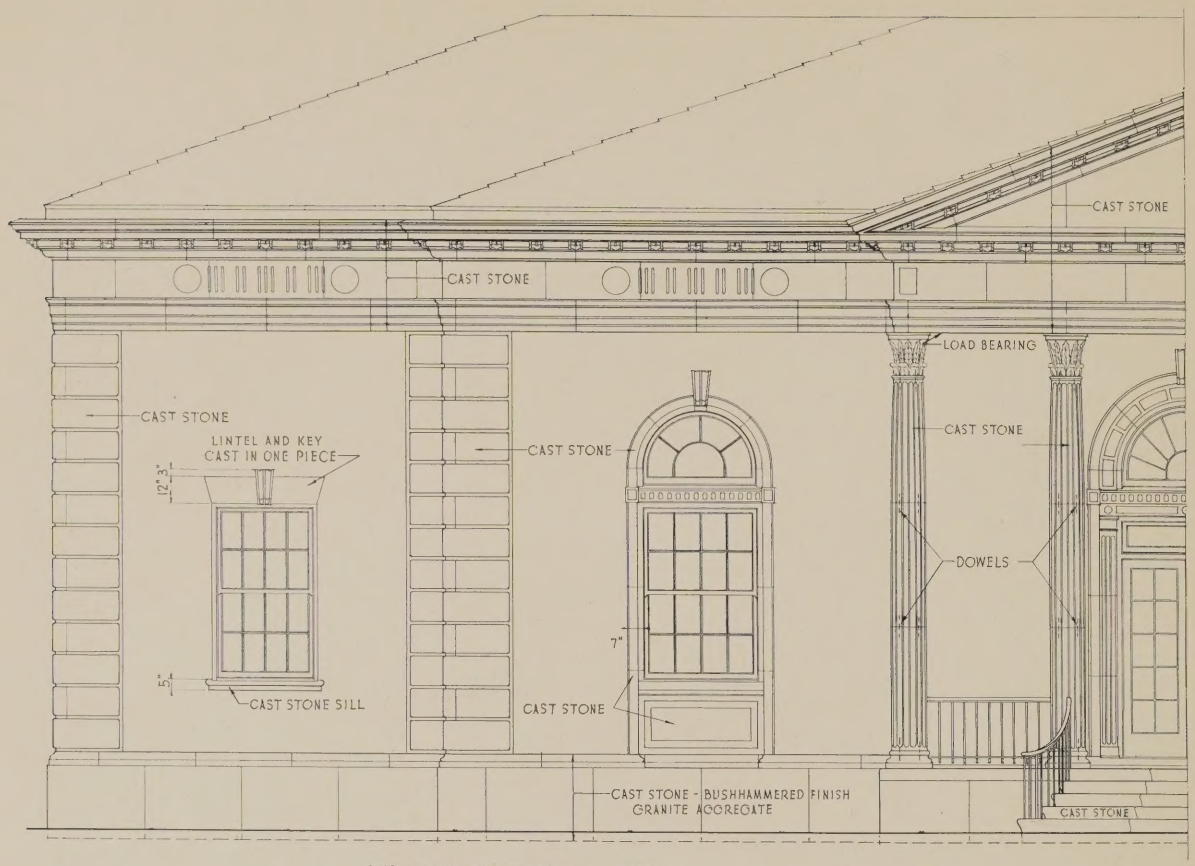
PRINTED IN U. S. A.

AVERY CLASSICS

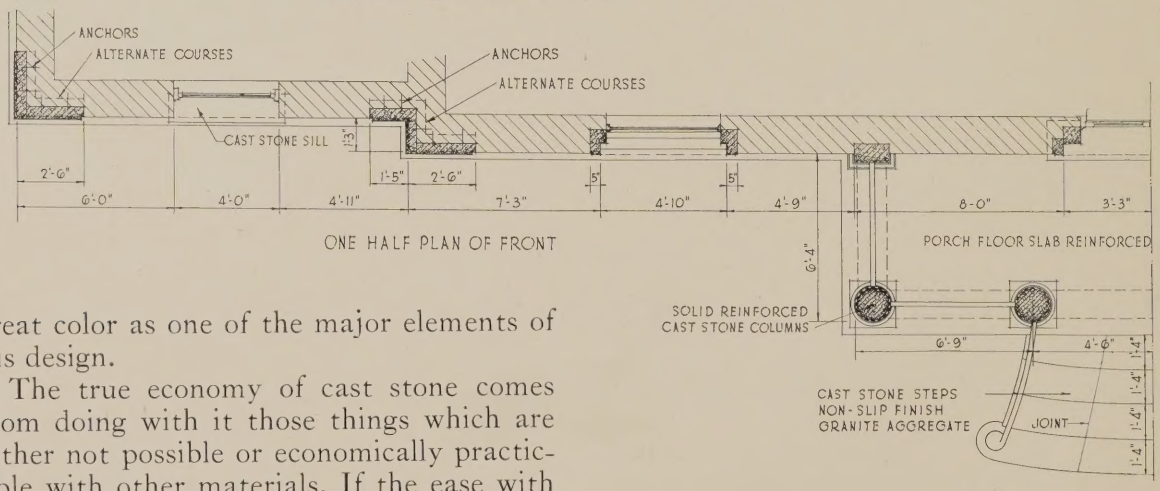
SUGGESTED DESIGN FOR SMALL POST OFFICE

Red Brick With White Cast Stone Trim

The possibilities for imaginative color treatments are especially apparent in buildings which combine brick and cast stone. Then, indeed, may full benefit be derived from the brick manufacturer's art. The architect may choose freely his brick for color and texture and then obtain in cast stone the matching or contrasting color required to complete the effect he has visioned. All too frequently it happens that the brick is painstakingly selected for color and texture only to have the whole effect spoiled through the use of a trim having drab and cold appearance. Through cast stone, an almost endless range of color is provided and the architect is enabled to



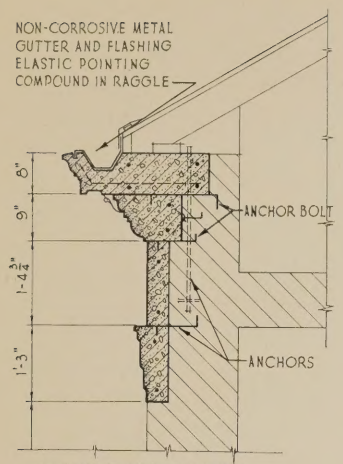
ONE HALF ELEVATION OF FRONT



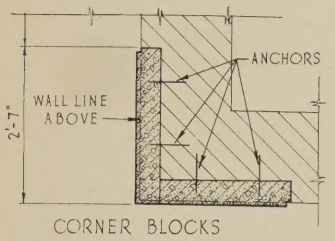
ONE HALF PLAN OF FRONT

treat color as one of the major elements of his design.

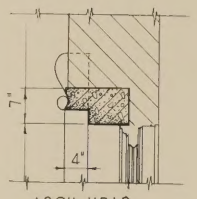
The true economy of cast stone comes from doing with it those things which are either not possible or economically practicable with other materials. If the ease with which cast stone may be formed into any desired size or shape, its adaptability to special construction methods, its capacity for economical ornamentation, its wide range of color, and its uniformity of color and appearance are not utilized for the sake of what these qualities can contribute to the design, there is little reason for employing cast stone in the actual construction of the building. If advantage is taken of the freedom of design offered by cast stone, then it is on that basis that comparisons of costs should be made. When used understandingly, cast stone gives maximum return for the money expended.



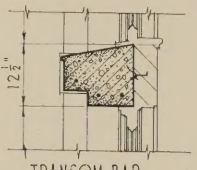
CORNICE AND GUTTER



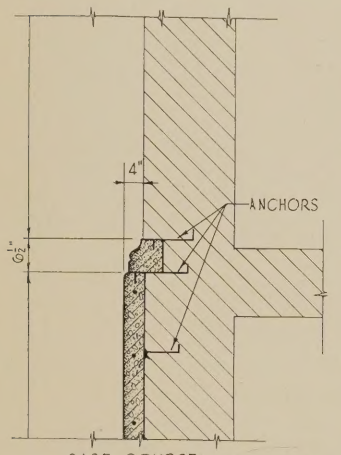
CORNER BLOCKS



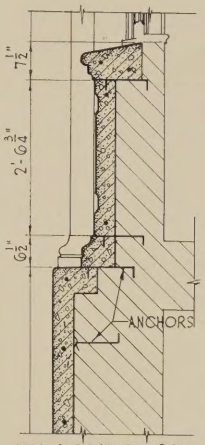
ARCH HEAD



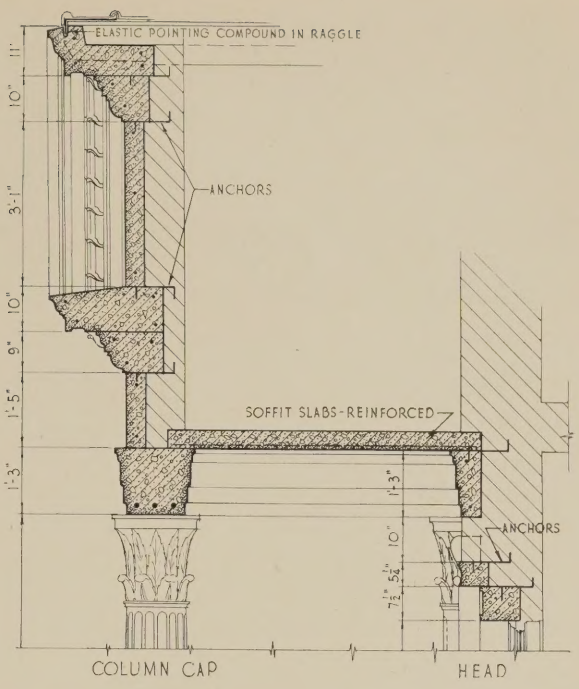
TRANSOM BAR



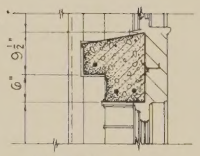
BASE COURSE



SILL & BASE COURSE



COLUMN CAP HEAD



TRANSOM BAR

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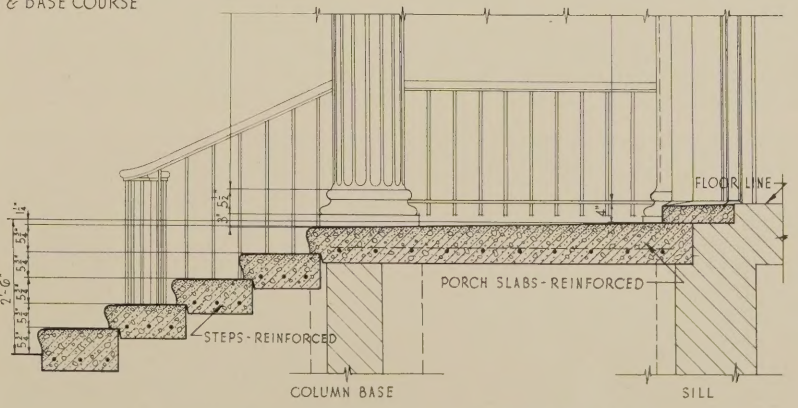
CHICAGO



SECTION THRU ENTRANCE PORCH AND ENTRANCE DOOR

PRINTED IN U. S. A.

CAST STONE panels in color depicting the history of Oklahoma, from the coming of the white man to the generation of the future, make up the frieze on the front of Stonewall Jackson Junior High School in Oklahoma City. Hawk and Parr, of Oklahoma City, were the architects.

The colors in the panels are three shades of buff and blue. Crushed Verona Yellow Marble was used for the light buff, crushed gravel for a dark buff, and a mixture of the two for the intermediate shade. For the background, a blue vitreous aggregate with a sprinkling of green and purple aggregates was used. These panels are 8½ ft. by 3½ ft. by 4½ in. thick.

The first panel, entitled, "The Coming of the White Man," depicts the first entry of the Spaniards into what is now the State of Oklahoma.

The second panel, "The Trail of Tears," tells the story of the removal of the Cherokees from North Carolina into Oklahoma, or the coming of the Indian tribes to the reservations during the early years of the nineteenth century.

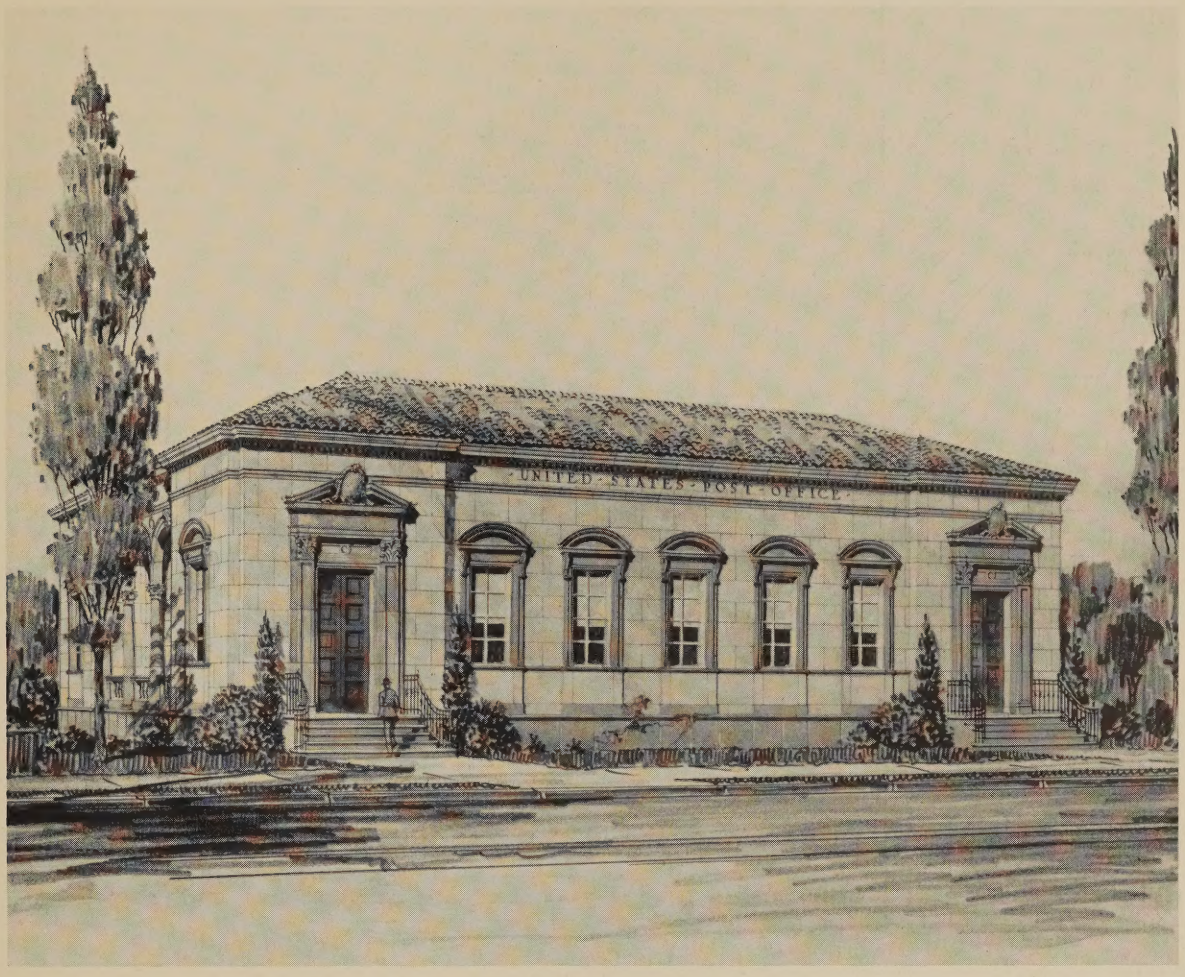
The third panel, "The Cowboys," symbolizes the great cattle drives when herds were brought across Oklahoma between 1865 and 1885.

The fourth panel, "The Run," marks the first opening of Oklahoma in 1889 and the subsequent openings which laid the foundation for statehood.

The fifth panel, called "Modern Youth," expresses the hope for the future. In the background may be seen the symbols of the great skyscrapers of "Oklahoma of Tomorrow."

Between each of the five panels is a symbolic shield. In the lower right hand corner of the shield is the Indian buckskin shield taken from the Oklahoma state flag. The upper left hand quarter is an emblem often used as a design motif by the Plains Indians. The other quarters are crosses from Spanish shields.

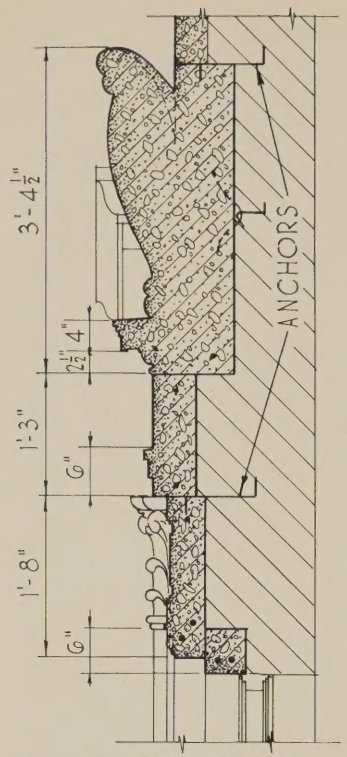
AVERY CLASSICS



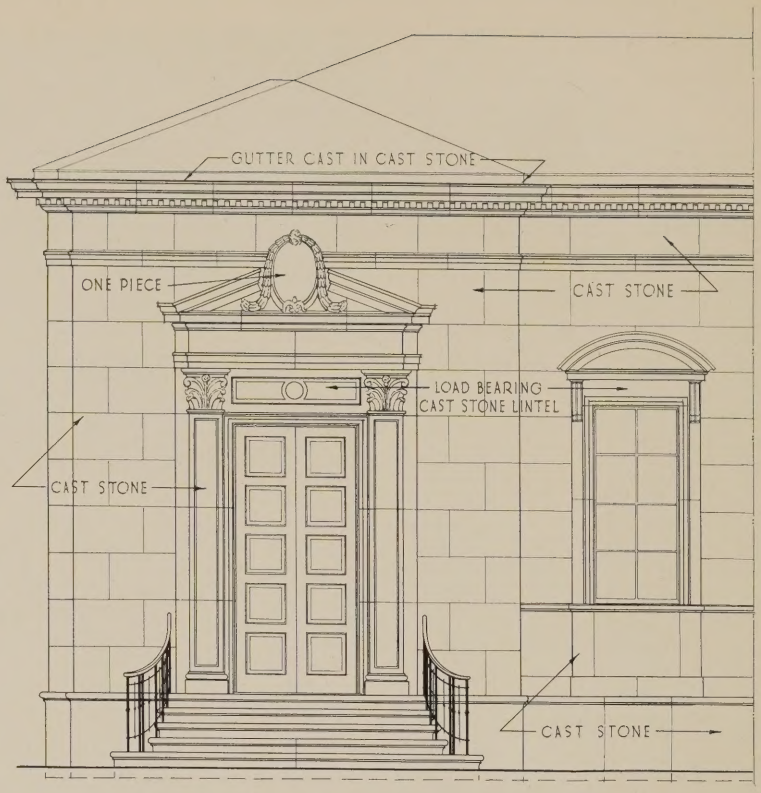
SUGGESTED DESIGN FOR A SMALL POST OFFICE BUILDING

Cast Stone Exterior

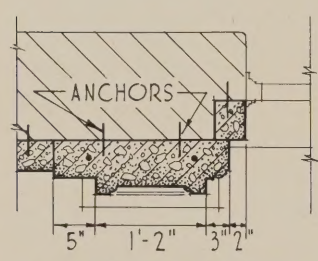
A wide range of color is but one of the advantages offered by cast stone. In addition, it provides close color *control*. The designer may not only have the colors he desires, but he can have them when and where he wants them. Color in cast stone, whether it is produced by colored aggregates or by mineral pigment, is the product of a definite formula that can be duplicated endlessly or varied at will. In cast stone there need be no uncontrolled variations in tone and texture to obliterate architectural lines and obscure ornamental details. Out of control, variegation may spoil a perfect design; under control, variegation multiplies the usefulness of color as a primary element of design.



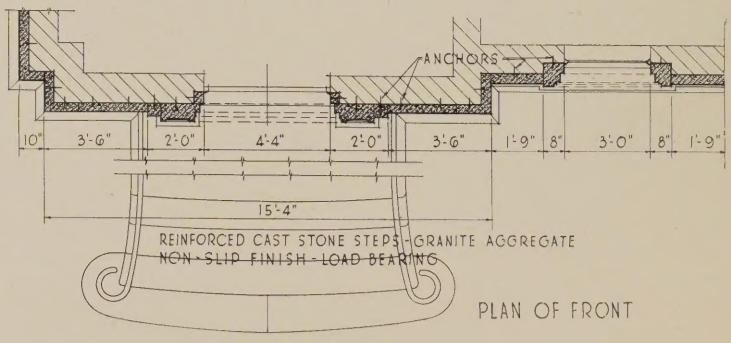
HEAD OF ENTRANCE DOOR



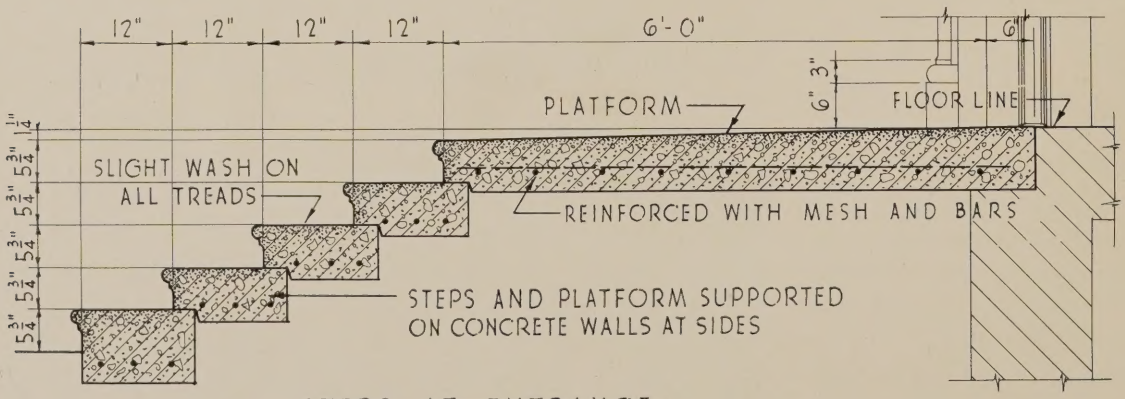
ELEVATION OF FRONT



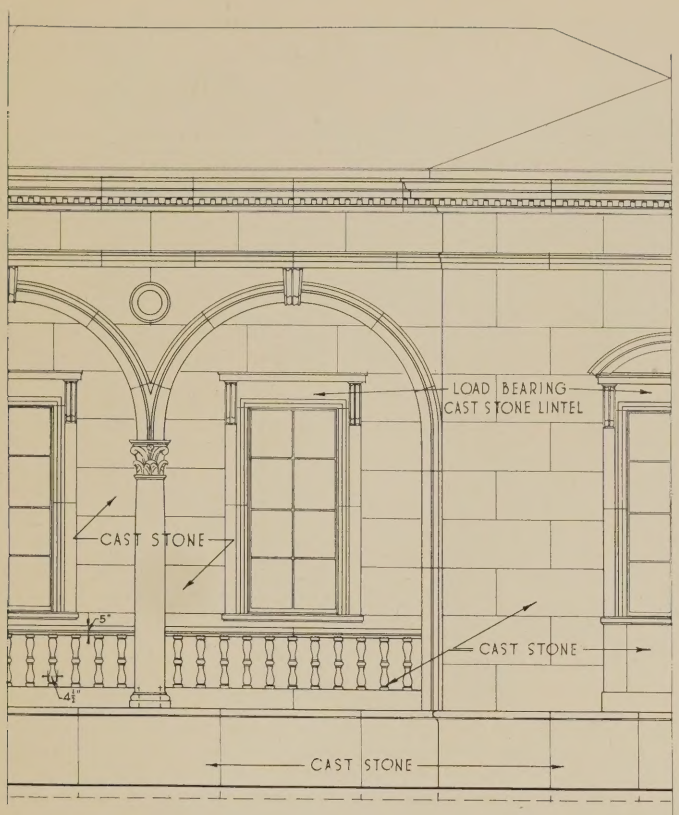
PILASTER AT ENTRANCE



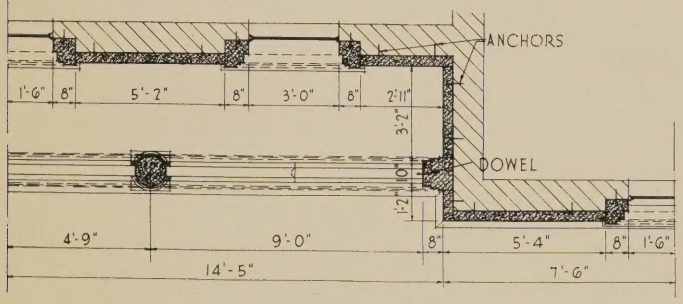
PLAN OF FRONT



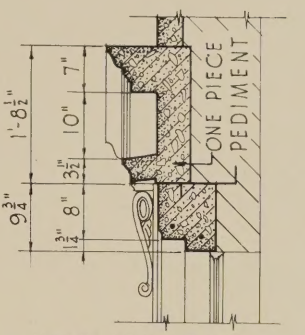
STEPS AT ENTRANCE



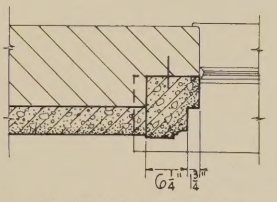
ELEVATION OF SIDE



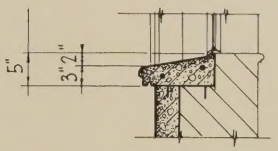
PLAN OF SIDE



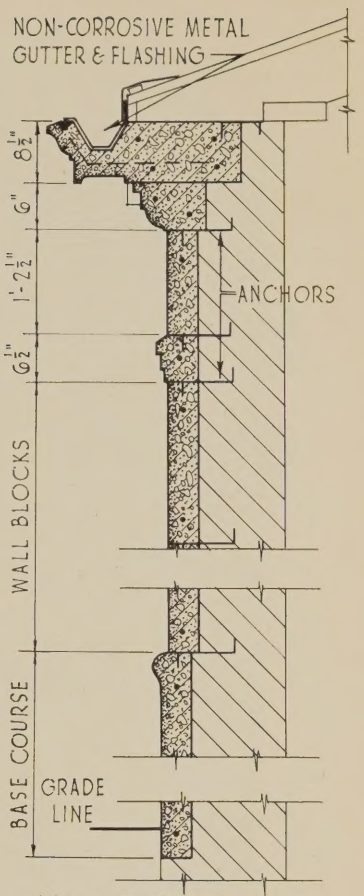
HEAD OF WINDOW



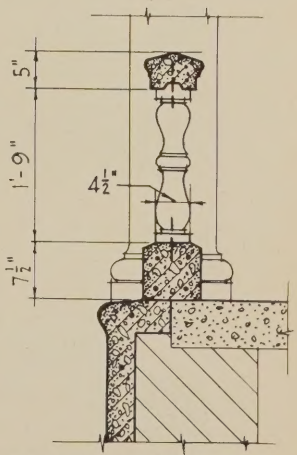
JAMB OF WINDOW



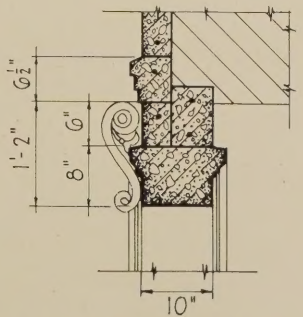
SILL OF WINDOW



WALL SECTION



SECTION THRU RAIL



SECTION THRU ARCH

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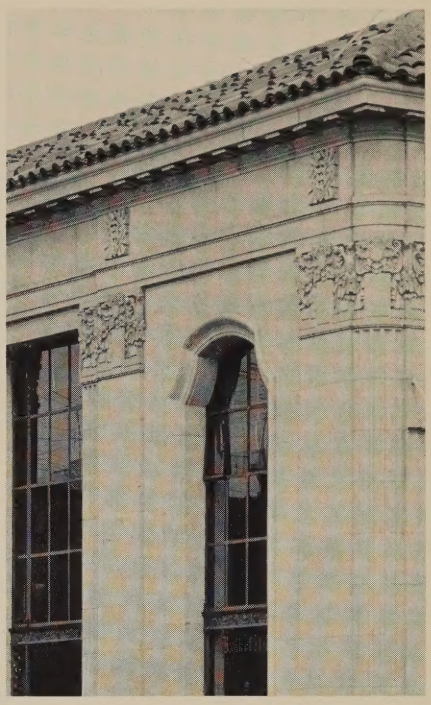
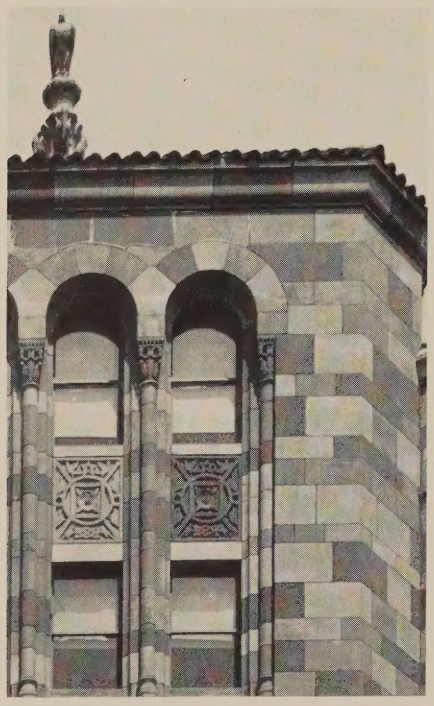
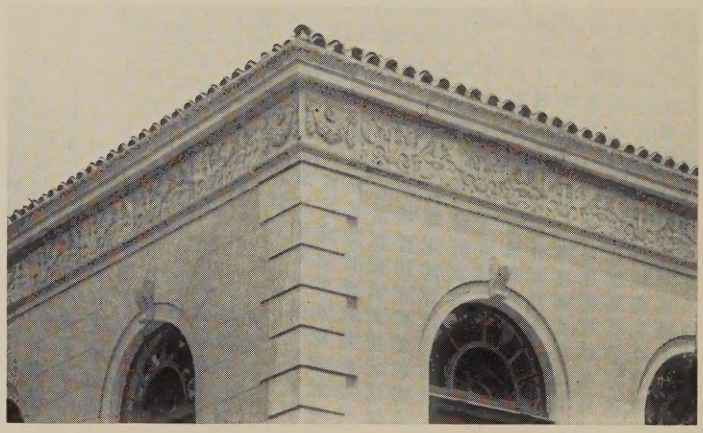
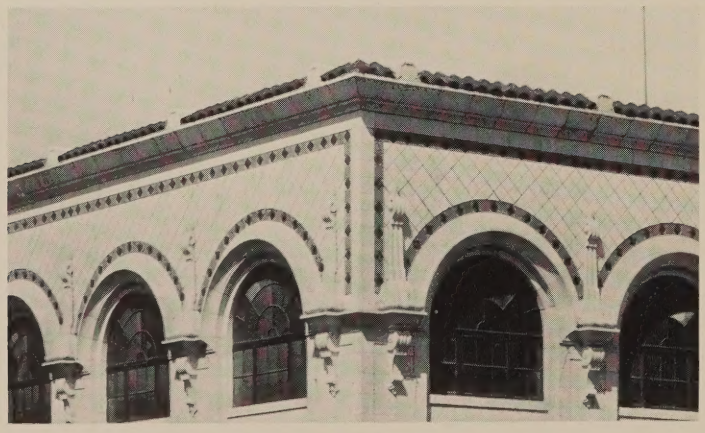




DETAILS IN CAST STONE

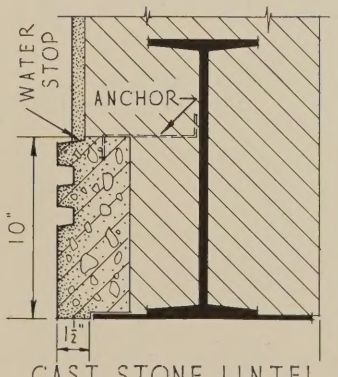




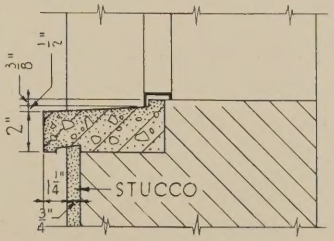
The photographs on this page illustrate in detail various treatments of cast stone on cornices and eaves of buildings similar to that suggested on Page 1. These examples typify the adaptability of cast stone to many variations of one general design motif.

AVERY CLASSICS

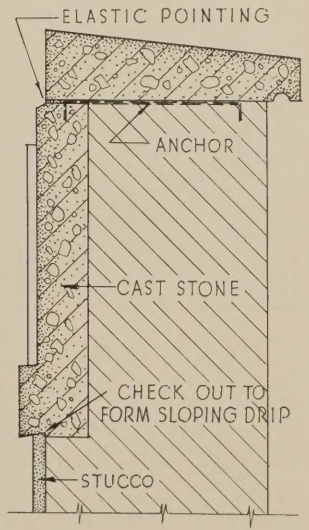
Cast stone and portland cement stucco were both utilized in remodeling this twenty-two year old building at 1302-12 Morse Avenue, Chicago. B. Leo Steif and Co., were the architects. Projecting brick work was chipped off flush with the wall and the stucco was applied direct to the hard-burned, rough surfaced brick. Flutings above and below the windows are stucco. The base course is polished black cast stone. Coping and entrance are white cast stone with rubbed finish.



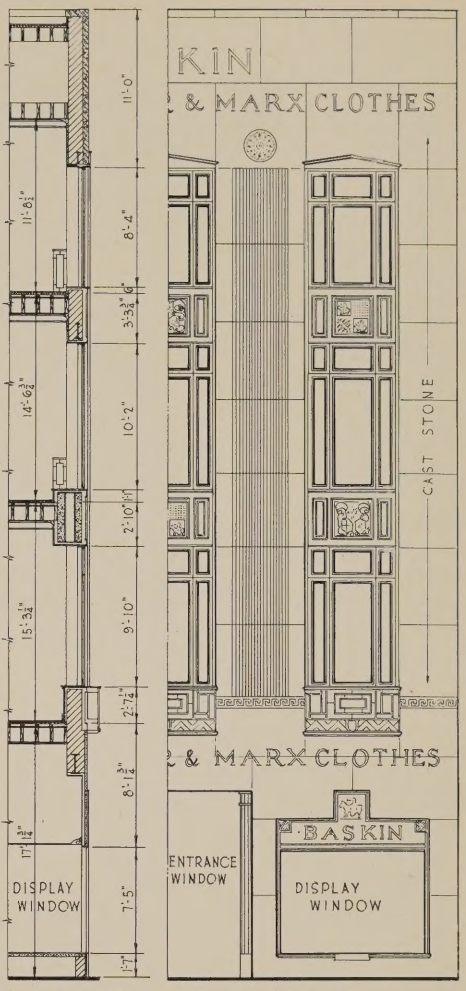
CAST STONE LINTEL



CAST STONE SILL

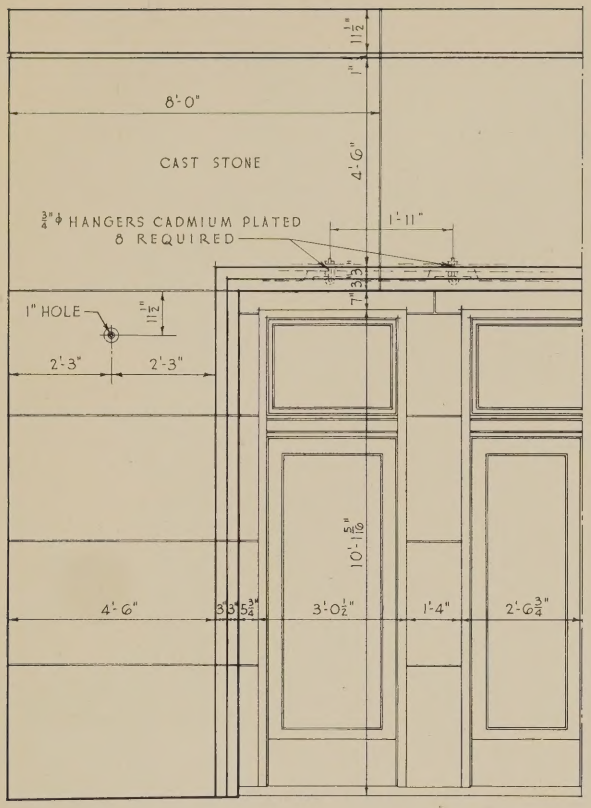


DETAIL OF COPING

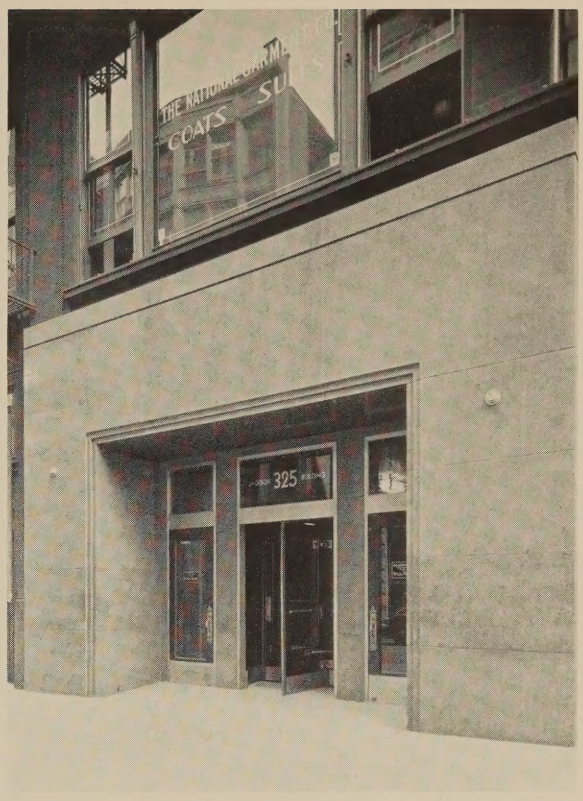


WALL SECTION ONE HALF ELEVATION

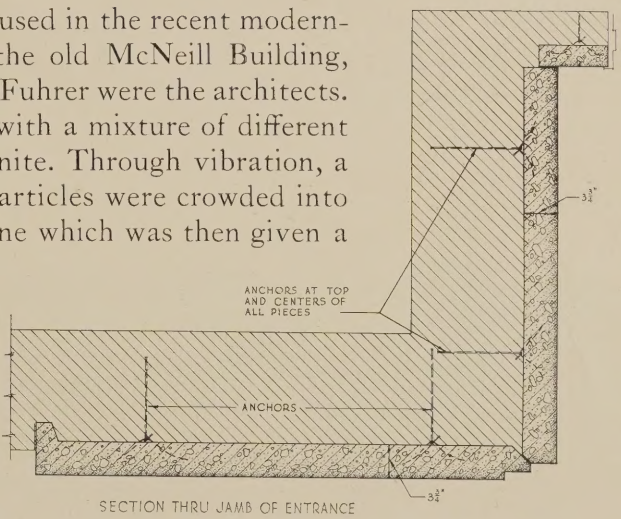
In transforming the old F. B. George Company building, Chicago, into a modern store for Baskin's, cast stone of a light buff color was used for the new front above the first floor. On this job the architects, Holabird and Roche, took advantage of cast stone's ability to be made in large, thin pieces of uniform color.



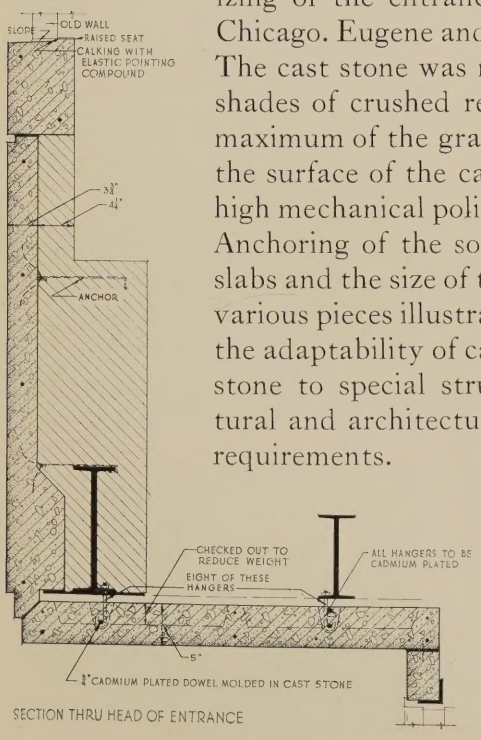
ONE HALF ELEVATION



Polished cast stone was used in the recent modernizing of the entrance to the old McNeill Building, Chicago. Eugene and Max Fuhrer were the architects. The cast stone was made with a mixture of different shades of crushed red granite. Through vibration, a maximum of the granite particles were crowded into the surface of the cast stone which was then given a high mechanical polish. Anchoring of the soffit slabs and the size of the various pieces illustrate the adaptability of cast stone to special structural and architectural requirements.



SECTION THRU JAMB OF ENTRANCE



SECTION THRU HEAD OF ENTRANCE

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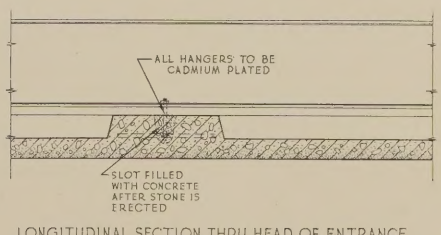

LONGITUDINAL SECTION THRU HEAD OF ENTRANCE

An Investment in Good Appearance

Many structurally sound buildings in advantageous locations are empty because their appearance is out-of-date. A new front may be all they need to give them modern attractiveness and enable them to compete with newer structures for desirable paying tenants.

Every such building is a potential prospect for an architect's services. It takes the trained and experienced imagination of an architect to see the possibilities behind dingy, old exteriors.

Because of its structural and architectural adaptability, cast stone is especially suitable for remodeling these old buildings. The examples here reveal how cast stone is being used for this type of work.

1735 Sansome St.
Philadelphia, Pa.
Simon & Simon, Architects

436-438 Broadway
Camden, N. J.

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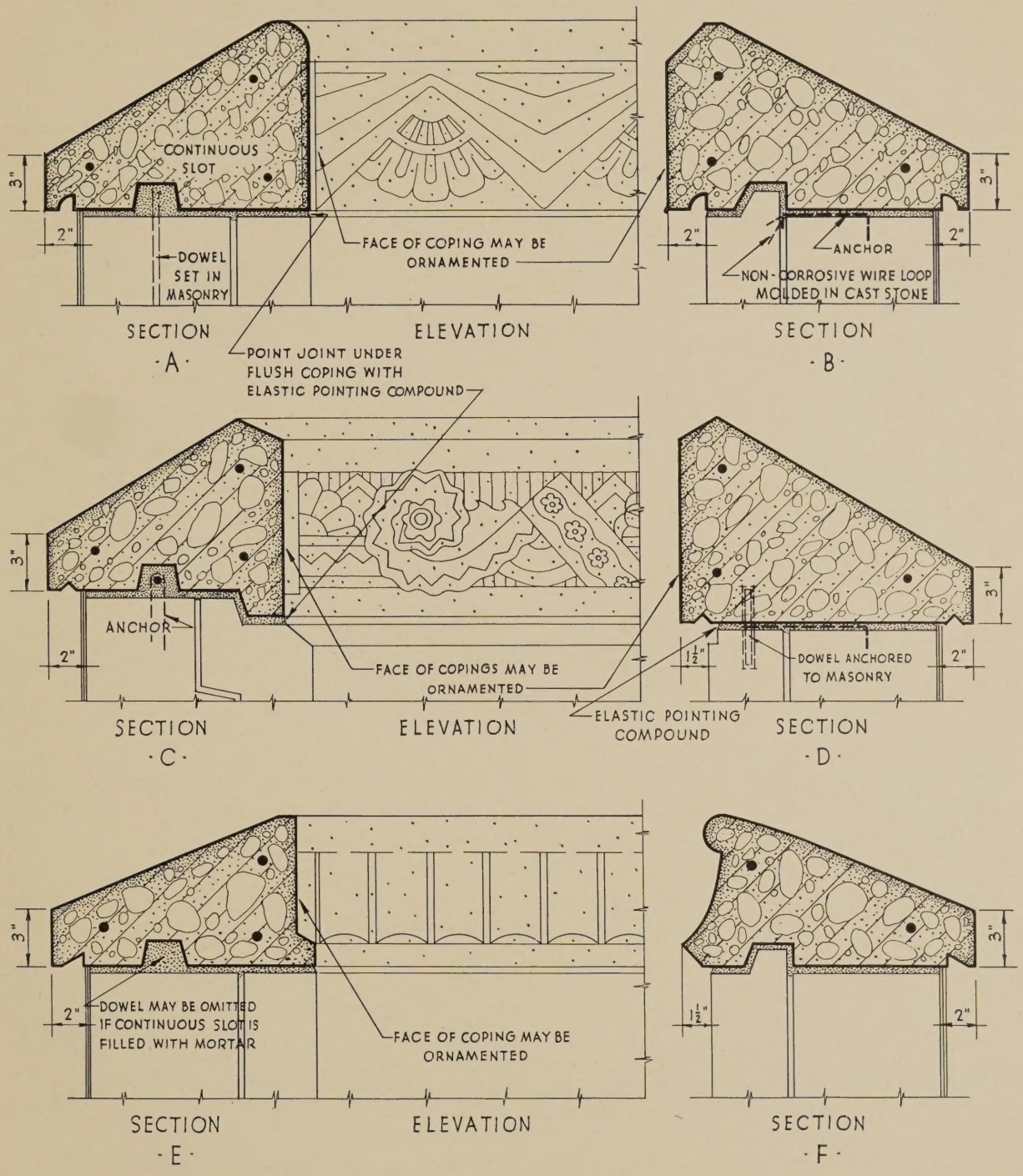
AVERY
CLASSICS

Copings and Coping Joints

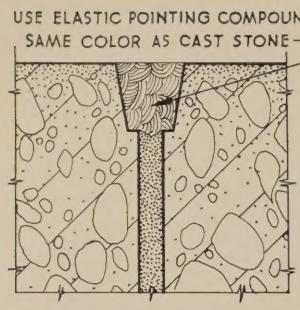
BULLETIN
NO. CS-1A
CAST STONE INSTITUTE



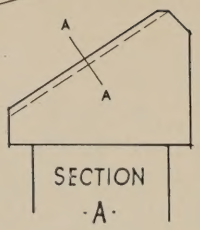
NOTE - COPINGS SHOULD SLOPE TO REAR SO AS TO REDUCE WASH OF WATER AND ACCUMULATED DIRT OVER FACE OF WALL. SLOPE SHOULD BE STEEP AS POSSIBLE FOR RAPID SHEDDING OF WATER. STEEP WASHES ON CAST STONE COPINGS INVOLVE NO ADDITIONAL EXPENSE AND IN MANY CASES REPRESENT AN ECONOMY.

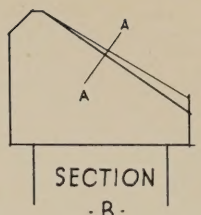
NOTE - INDIVIDUAL PRINCIPLES OF CONSTRUCTION SHOWN IN THE DIFFERENT DETAILS ARE INTERCHANGEABLE BETWEEN THE VARIOUS TYPES OF JOINTS AND THE VARIOUS STYLES OF COPINGS.

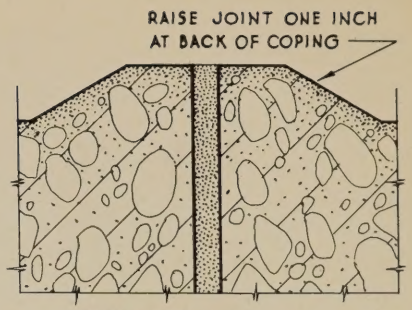
SCALE OF SECTIONS - 1½" = 1'-0"



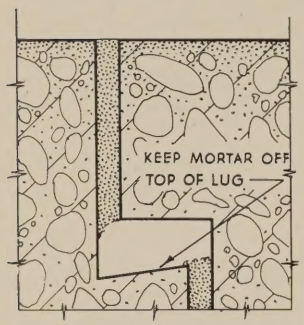
DETAIL ON LINE A-A
OF SECTION A



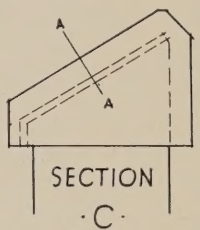


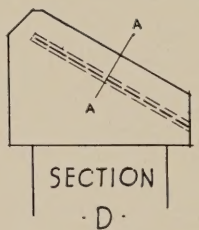


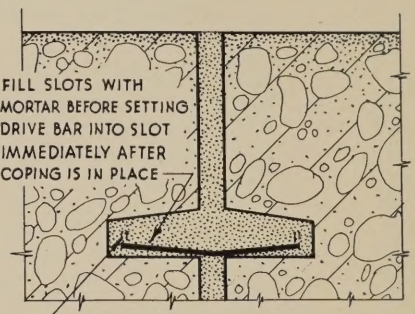
DETAIL ON LINE A-A
OF SECTION B



DETAIL ON LINE A-A
OF SECTION C

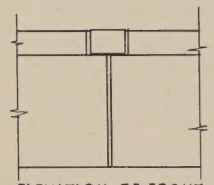




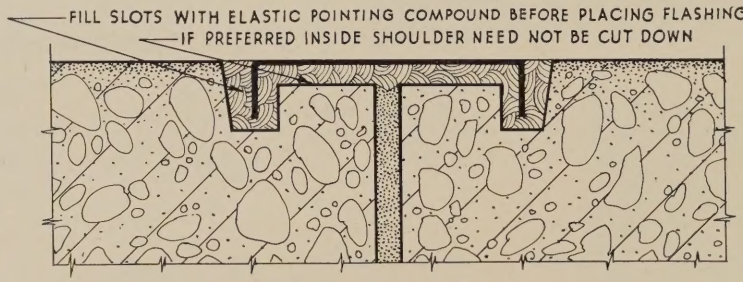


METAL MAY BE FLAT
WITH EDGES TURNED
UP $\frac{1}{8}$" IF PREFERRED

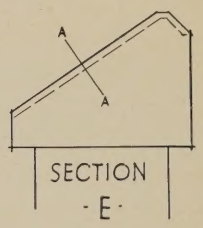
DETAIL ON LINE A-A
OF SECTION D

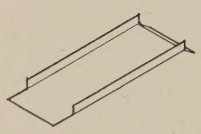


ELEVATION OF FRONT
OF COPING SHOWING
FLASHING BENT DOWN
OVER FRONT WASH

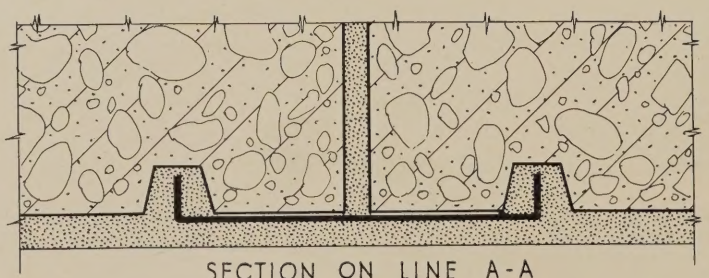


SECTION ON LINE A-A
OF SECTION E

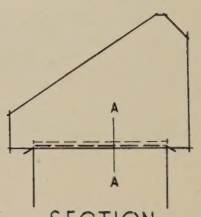




ON FLUSH COPING
USE FLASHING WITH
FLAT LIP TO EXTEND
TO FACE OF WALL



SECTION ON LINE A-A
OF SECTION F



NOTE - SOME OF THESE COPING JOINTS ARE MORE ADAPTABLE TO ONE METHOD OF MANUFACTURE THAN TO ANOTHER. ARCHITECTS SHOULD CONSULT LOCAL CAST STONE MANUFACTURERS BEFORE DECIDING DEFINITELY UPON TYPE OF JOINT TO BE USED.

NOTE - FLASHING MATERIAL MUST BE NON-CORROSIVE. WHEN FLASHING PROJECTS TO FACE OF WALL OR IS VISIBLE IT SHOULD BE MADE OF HARD LEAD OR LEAD COATED COPPER OR STEEL.

SCALE OF JOINT DETAILS - HALF FULL SIZE

PREVENTION OF LEAKAGE THROUGH COPINGS

Copings are the first line of defense against the entry of moisture into masonry walls. Their effectiveness in keeping water out depends entirely upon the way in which they are designed and constructed.

Responsibility for wet walls is continually being laid to porosity of copings, in spite of the fact that all materials commonly used for copings are impermeable to water under conditions to which they are ordinarily subjected. Cast stone especially has often been accused of permitting the passage of moisture directly through it. No authenticated instance of such permeability has ever been reported. On the contrary, in numerous cases where examinations have been made, the charge has been clearly disproved. Even medium grade cast stone is not permeable under sustained water pressure much higher than is ever likely to be exerted on copings.

When leaks through copings occur it will invariably be found that the joints are open. Opening of joints in stone copings may be caused by (1) contraction of the stone due to drying out or to temperature changes, (2) shrinkage of mortar, or (3) settlement of the supporting walls. The chances are that one or more of these causes of open joints will be present on every job. Temperature changes are bound to occur. They may amount to as much as 100 degrees. On a stretch of coping 50 feet long a temperature drop of 50 degrees means a shortening of approximately .2 inch. Under the strain induced by such contraction some of the coping joints are almost certain to open. Furthermore, the repeated expansion and contraction of stone due to ordinary changes in temperature and to alternate wetting and drying tends gradually to break down the rigid type of mortar joints, with consequent penetration of water.

Ordinary prudence requires that provision be made to protect masonry walls from the entrance of water through the opening of coping joints. It is unsafe to expect that permanent watertightness can be obtained in the standard straight-sided joint sealed with any of the rigid types of mortar. For that reason, it has been customary to use continuous flashing under copings when absolute assurance against water penetration was desired.

Providing for a rapid shedding of water from the top of the coping is one of the most effective means of keeping the wall dry. Cast stone is especially adaptable to this requirement. Steep washes can be made on cast stone coping at no additional expense and in many cases represent an economy.

Cast stone also offers several practicable methods of making coping joints watertight at much less expense than is involved in the usual method of accomplishing this through the use of continuous flashing. A simple and effective type of joint is shown in Section A on the opposite page. The upper edges of the joint face are checked out to a width of ¾ inch and a depth of ¾ inch and filled with an elastic pointing compound. The enlarged joint gives the pointing greater body which prolongs its effective life considerably beyond what is generally experienced with similar pointing in narrow, shallow joints. The larger joint also facilitates the pointing operation.

Section B shows a typical raised joint which is easily made in cast stone and is effective in preventing a concentrated flow of water over the joint itself.

Section C shows an overlapping cast stone joint which has been found very effective. If moisture gets into the joint it is caught on the lug and carried out to the back of the wall. In order not to clog the drain, it is best not to place mortar on the lug.

Sections D, E and F show different methods of flashing coping joints. In the case of

flush copings on buildings of considerable height, the slots for the flashing shown in Sections E and F might be extended fully to the face of the coping without being noticeable. In cases where this method cannot be followed, the joint may be completely protected by extending a flat lip on the flashing strip out to the front edge of the coping.

The type of coping joints shown in the foregoing details are natural to cast stone. They add little or nothing to the cost of the coping. Although they are simple and will withstand considerable abuse, they are not foolproof. With the exercise of even reasonable care in handling and setting, these joints will provide effective protection against damage from moisture penetration.

THE purpose of these bulletins, and those to come, is to illustrate principles in the fabrication and use of cast stone, rather than to show specific methods of handling specific problems. The actual details are secondary to the principles which they illustrate. Every effort has been made to have the sheets reflect the most advanced practices in cast stone. However, individual cases will undoubtedly require modifications in the suggested details. For best results, architects should consult with local cast stone manufacturers while plans are being prepared.

It is recognized that the technic of cast stone design and construction can be fully developed only by architects themselves as they apply cast stone principles and utilize cast stone's advantages in the solution of their individual building problems. To supply the necessary assistance and encouragement in the form of suggested details and technical information, these Bulletins are presented on behalf of the industry. The series will be continued until all the principal features of design and construction with cast stone have been covered.

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AVERY CLASSICS

STANDARD SAMPLES OF CAST STONE

A Basis for Specifying Color and Finish

Purpose of standard sample plan

Standard samples on color and finish have been adopted by the cast stone industry in order to provide (1) a means by which purchasers of cast stone can specify exactly what is wanted, and (2) a standard by which the delivered product can be judged.

Architects desiring to use cast stone are seldom in position to specify outright the product of a particular manufacturer. Attempts to control quality and appearance of cast stone by specifying the materials and methods to be used in its manufacture have generally been unsafe and unsatisfactory. Attempts to specify appearance of cast stone according to a written description of color and finish lead to misunderstanding because such specifications are subject to widely different interpretations by different manufacturers. Such specifications are impossible to enforce.

From an architect's viewpoint, the standard sample plan has all the advantages and none of the disadvantages of specifying cast stone according to a particular brand. Within the range of colors and finishes covered by this plan, the architect can indicate clearly what is desired. Manufacturers are able to submit intelligent competitive bids because they know exactly what is wanted.

Basis of standardization

Standardization of cast stone is possible because the principles and practices underlying its manufacture are of such uniform and constant application as to permit very close control of the appearance and quality of the finished product. It can be made to meet any reasonable predetermined requirements as to physical quality and appearance. One manufacturer, if he desires, can satisfactorily duplicate the product of any other manufacturer.

Origin of standard samples

The original samples of cast stone adopted as standard were chosen from a group of 104 unidentified samples submitted by 31 manufacturers in an exhibition held in Washington, D. C., June 15-17, 1932. One-half of each original sample was retained at the Bureau of Standards and one-half was sent to the Cast Stone Institute to be matched. Formulas for matching the original samples were worked out by the Institute. This information, together with small standard reference samples and samples of ingredients, is available to all established cast stone manufacturers who desire to prepare themselves to furnish cast stone matching the standard samples.

Range of colors and finishes

Included in the present set of 14 standard samples are seven shades of buff and seven shades of gray. Four finishes are included—rubbed, bush hammered, etched, and brushed. Color may be specified according to one sample and finish according to another. Standards on other colors and finishes will be adopted as the demand arises.

Identification of samples

Each standard reference sample bears a number which identifies the color and finish of that sample. In order to specify cast stone matching one of the standard samples it is only necessary to refer to it by number. Since all manufacturers have, or can quickly obtain, duplicates of these samples, with their respective formulas, they are in posi-

tion to know exactly what is desired and to what they must conform.

Method of comparing with standard samples

The Commercial Trade Standard (TS-1856) covering colors and finishes of cast stone prescribes the following method of making comparisons with standard reference samples:

"7. In making comparisons with standard reference samples, observations shall be made from a distance of ten feet. The surfaces being compared shall be in the same vertical plane. Comparisons shall be made by the light from a northern sky. A neutral gray mask with two apertures four inches square and six inches apart shall be used to expose equal areas of the two surfaces to be compared. The surfaces being compared shall be considered to match satisfactorily if there is no appreciable difference in their appearance under the specified conditions of comparison."

Physical quality of cast stone

The standard samples of cast stone are intended to control *only color and finish.* Physical quality should be specified according to the requirements of each job. The American Concrete Institute Tentative Specification for Cast Stone sets 5,000 lb. per sq. in. as the *minimum* permissible compressive strength and 7% as the *maximum* permissible absorption for durable cast stone. It is suggested that higher strengths and lower absorptions be specified for cast stone which is to be used as steps, platforms, base courses, etc. If desired, compressive strengths up to 10,000 lb. per sq. in. or higher and absorptions of 4% or less can be specified and readily obtained.

Qualifications of manufacturers

A list of manufacturers prepared to furnish cast stone matching standard samples is maintained by the Cast Stone Institute. Inclusion in this list signifies that a manufacturer is willing to certify to purchasers that cast stone which he furnishes under standard sample specifications will conform in color and finish to the corresponding master samples maintained at the Bureau of Standards and the Cast Stone Institute. Inclusion in the "willing-to-certify" list is not in itself a guarantee of a manufacturer's integrity, experience or ability in the execution of cast stone work. Established reputations and examples of completed jobs are the most reliable indications of the qualifications of individual manufacturers.

Alternates for cast stone

When alternates are specified for cast stone matching standard samples they should be commensurate in quality and appearance with the cast stone specified. High-grade cast stone with expensive finishes cannot fairly be expected to compete with low-grade, cheaply finished alternates.

Enforcement of specifications

As supervisors of building construction, architects have the chief responsibility for enforcing specifications on materials and workmanship. Non-enforcement of specifications is almost invariably attended by a lowering of quality. Reputable cast stone manufacturers welcome strict enforcement of specifications. It protects them, the industry and the purchaser against inferior products of irresponsible manufacturers. The Cast Stone Institute will cooperate with architects in the enforcement of standard sample specifications on cast stone. It is prepared to determine whether material delivered to a project complies with the specifications. In special cases, a representative of the Institute will make job or plant inspections if requested by the architect.

(Architects desiring to inspect sets of standard samples of cast stone, or to use this plan in specifying cast stone, are requested to get in touch with one of their local cast stone manufacturers or with the Cast Stone Institute, 33 West Grand Avenue, Chicago.)

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BRIEF FORM OF SPECIFICATION

Provisions affecting the manufacture of cast stone suggested for inclusion in architects' specifications on individual jobs. Additional requirements on architectural or construction details should be included as necessary:

Manufacturer

Cast stone shall be the product of an established manufacturer whose products have previously been used in similar work with satisfactory results.

Physical Quality

Cast stone shall have a compressive strength of not less than 5,000* lb. per sq. in. and an absorption not greater than 7%* when tested according to the requirements of American Concrete Institute Tentative Specification P-3-A-29T.

Color and Finish

Cast stone shall closely match in color and finish Cast Stone Reference Sample No. .....†.

Workmanship

All pieces shall be true to dimensions and profiles with sharp, straight edges. Moldings and arrises shall be sharp, true and continuous at the joints. All ornamentation shall faithfully reproduce approved models or details.

Curing

Cast stone shall be thoroughly cured and seasoned and shall have attained the specified strength and density before being delivered to the building site. No cast stone shall be delivered before it is 28 days old unless it has been thoroughly cured and seasoned by special methods approved by the Architect.

Samples

Each cast stone manufacturer bidding on this work shall submit to the Architect for inspection a sample of the cast stone which he proposes to furnish, together with references and a list of representative jobs. Before submitting his bid the General Contractor shall obtain from the Architect a list of approved cast stone manufacturers, or he may submit a bid indicating the manufacturer or manufacturers whose cast stone he proposes to use.

Tests

The Architect may select or cause to be selected at random one or more pieces of cast stone for testing. Tests shall be made at the Manufacturer's expense and pieces of cast stone taken for testing shall be replaced by the Manufacturer without charge. In the event cast stone delivered to the building site fails to match the approved sample or to meet the specified requirements on physical quality, the Architect shall have the option of (1) rejecting the cast stone, (2) requiring the Manufacturer to refinish on the job any cast stone not showing the specified finish, or (3) requiring a three-year bond from the Manufacturer against damage arising from the failure of the cast stone to meet the specified physical requirements. Disputes arising from enforcement of this provision shall be arbitrated by a committee consisting of 1 representative each of the Architect and the Manufacturer and 1 member selected by these two.

*Physical quality should be specified according to the requirements of the job.

†Architects desiring color and finish not within the range of the standard reference samples should make their description of the desired color and finish as clear as possible.

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CAST STONE AS A MEANS TO COLOR IN ARCHITECTURE

An address presented at the 1932 convention of the American Concrete Institute, Washington, D. C., by Fred R. Lear, Professor in charge of Architectural Design, Syracuse University.

Owing to Man's search for relief from the restrictions of a machine age, we are entering upon the most colorful epoch of modern history. All about us we see the results of a demand for color, more color. Witness this in the variegated motor cars offered by automobile manufacturers in the last few years. New color schemes go hand in hand with free wheeling. In our kitchens, cheerfulness is introduced in the colors of the fixtures and appointments. And even in the cooking utensils themselves, our wives demand pleasing colors where our mothers looked for service alone. Compare the gay gowns that our ladies wear for a day with the somber long service dresses worn by our grandmothers. In fact, we are said to be "color minded" and are far better equipped to satisfy our desire for color than in any previous era. The rapid development in various lines of coloration is but one more step in Man's ceaseless efforts to gratify his inherent desire for beauty.

Without some decoration, the mechanical precision of functional buildings can never fully satisfy our aesthetic tastes. Looking back on architectural history, we find that the styles involving simple surfaces were always the richest in their materials. So now, when the modern style is striving to solve new structural forms and calls for a simplified treatment, the character of the surfaces must be more carefully studied. And we naturally turn to more colorful effects to relieve the monotony and hardness that are likely to result in the designs of today. Here is cast stone's golden opportunity.

Cast stone, in common with most man-made building materials, passed through a long incubation period, in which it imitated natural products. This extended from the first rock-face cement blocks down to the realistic reproductions of marbles and granites. Although there is still a demand for cast stone in this capacity, let us aim to capture the spirit of the beautiful colors of nature rather than make slavish copies. It seems that some timidity still persists. No apology need be made for cut cast stone simply because it is manufactured. Let us but realize that civilization advances because man is never satisfied with things as he finds them and strives to improve conditions. But for his ingenious and searching nature, we would be killing our dinner with a handy stone and warming ourselves in a huddle about a camp fire in a cave. Cast stone is one of the results of man's efforts to improve on natural building stones and has been perfected to the point where, because of its intrinsic value, it has justly established its worth in the test for form, strength, durability and color.

This address is not concerned with all of the fine qualities cut cast stone must possess to meet the demands of modern construction. Let me talk about its one great possibility, the power to contribute to the beauty of buildings. To my mind, this is the factor that gives it its greatest advantage and appeal. Let us, however, be frank and admit

that it has some natural limitations in the color field; but it has such a wide range and great variety that it is destined to become our foremost chromatic building material.

For example, it is made in a full scale of neutral grays. The passing vogue of buildings designed in the bold contrast of black and white has been met by the development of perfect cast stone with these extremities of value. It can now be produced in an almost complete rainbow of hues that afford limitless combinations to please the eye. In addition there are the tints and shades of each hue that add even greater possibilities. And in all its colors there is richness caused by the graying effect of the cement. When carefully selected and tested pigments are used, cast stone shows but slight fading and discoloration—the loss of color being much less than in corresponding natural stones that are at all near to its cost level. With age it takes on a mellowness and charm that is denied to most vitreous products. Then too, when the cast stone is homogenous throughout its mass, it can be cleaned or resurfaced the same as natural stone.

The great benefit of flexibility of color is at once apparent in buildings combining brick and stone. When natural stone trim is used, the architect may first select the kind of stone and be restricted in his brick coloration or he may choose a brick which he admires and neglect the relation of the colors of the brick and stone. Both methods give poor and mediocre results. This can be readily understood if we consider that a nominal "red" brick has a variation in hue from orange to red violet. When cast stone and brick are combined, the architect can choose the desired brick and then select for the trim just the right hue to give the proper color harmony and then vary the tint of this color to bring out the exact contrast that the composition needs.

This great possibility of color treatment brings a corresponding grave responsibility and behooves all architects and owners to study and appreciate the harmony of color. They must know that all color is light. That is, color is not the result of direct contact with a pigment or colored dye. It is the reaction to a stimulus brought to our eyes on the "wings of light." Color harmony is the relation of the various light reactions and is as separate from the mixing of pigments as the mechanism of a piano is apart from the harmony of music. Our color schemes, therefore, must be based upon light reactions.

There are several theories concerning these, each one influenced by the view-point of its author. Here we may side step the argument over the nature of light, as we are interested primarily in its effects. The theory that founds color analysis on three primary light sensations—red, blue, and green—explains the artistic questions in design. This is generally known as "color by addition." It aids us to anticipate and understand color effects, to group these effects under kinds of harmony, and to correct displeasing results. However, we must sense that color and design appeal to human emotions and must, therefore, remain in the realm of opinion and cannot be reduced to fixed laws and cold formulas, as can the structural problems of the engineer.

When the architect or artist makes a colored rendering of a proposed edifice he does not select a single color and paint every part of the building with it. No. He introduces variations of hue and value in the rendering of the various surfaces. This is the expression of the effect he really desires in the building. He should know that the building itself can have exactly this effect, by the introduction of these same gradations in the color of the material of which it is built. Cast stone is an ideal

medium for such a scheme, because in it we have absolute color control and the designer may have the colors he wants exactly where he wants them.

The next easy step in harmonious treatment is the gradation of the color of a building in intervals of a rhythmic progression. This may be several values of a single hue or it may be made more interesting by using a number of closely related hues. The colors may be darker at the top or the bottom. The latter gives a feeling of greater stability and is more practical from the dirt standpoint.

We cannot omit the newest element to produce beauty—color lighting. When a building is erected of a white, light gray or very pale tints, cut cast stone affords a wonderful background for beautiful lighting. But when colored lighting is to be used upon a structure erected of colored material, there is a grave danger of disastrous results. If such a combination is to be used, the colors of both materials and lights must be conceived together so that they may be tested out before the building is begun. Absorption of light by the colored surfaces is the condition that should be carefully studied. We cannot get a certain color to result in a light combination unless that color is present in both the light and the material on which it shines. In addition to this, colored lights have other destructive actions. Perhaps the guiltiest of colors is red. This not only turns blues and greens to black by absorption but it changes all yellows to oranges, while red and red-violets appear as white under a red light. In both these cases the effects are for night only. Would it not be more logical to build with the desired colors and then illuminate with clear light, so as to have the beauty of the design visible both day and night?

There is still too much designing done without the consideration of color and when we find the clause, "color and finish to be selected," in the stone specifications, it gives this weakness away. And we may expect the effect to be mediocre or accidental.

From the beginning of a job, an Architect must study to adjust the plan to the demands of use and structure and, at the same time, carry on a search in the arrangement of the principal masses of the design. These are fundamental and at first crude, but they develop as the study progresses. The proportion and relation of these masses are the backbone of the design and far more important than exterior secondary subdivisions and details. Let me point out that the relative colors (involving both hue and value) of these masses are just as much a part of the composition as are their relative dimensions. In fact, these colors have a direct effect upon the apparent dimensions and as composition is all a question of apparent relations, it is logical that the color scheme should be a part of the original mass conception and influence the development as the design progresses. As soon as designers recognize this importance to architectural design, color will step out of its restricted role as decoration and trimming to play a major part. Then colored masses will be united to build up the forms of single buildings and elaborate groups, involving the complex forms of color harmony, and cut cast stone is admirably fitted to contribute the surfaces that, contrasted and blended, will produce a symphony of light and color. *(Reprinted by permission)*

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AVERY
CLASSICS

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AMERICAN CONCRETE INSTITUTE TENTATIVE STANDARD SPECIFICATION FOR CAST STONE

(P-3-A-29T)

I General

1. The term "cast stone" shall be understood to mean a building stone manufactured from portland cement concrete, precast and set in place as trim or facing on or in buildings and other structures.
2. The minimum average compressive strength of cast stone at the age of 28 days or less shall be 5,000 pounds per square inch when tested as 2 by 2 inch cylinders or 2 by 2 inch cubes in the manner hereinafter specified.
3. At the age of 28 days or less the average absorption of cast stone shall be not less than 3% and not more than 7% of water by dry weight of the specimen when tested as 2 by 2 inch cylinders or 2 by 2 inch cubes in the manner hereinafter specified.
4. All aggregate used in the manufacture of cast stone shall be of known durable quality.

II Selection of Specimens for Testing

5. Specimens for both compression and absorption tests shall be cut from stone as delivered on the job or from regular stock in the yard. Samples from which specimens will be cut shall be selected by the purchaser or his representative.
6. Specimens of faced cast stone for compression tests shall be cut in such a manner that the specimens are composed of approximately one-half of facing and one-half of backing material. Specimens shall be tested in the position which the cast stone is laid in wall.

III Methods of Testing

7. Not less than three and preferably five specimens shall be required for each test. In the event of failure to meet requirements in the first test, the test may be repeated on a second set of specimens.
8. Specimens for absorption test shall be dried at a temperature between 215° F. and 225° F. until the loss in weight is not more than 0.1% in two hours of drying. They shall be weighed and then submerged in water at a temperature of between 60° F. and 80° F. for 24 hours. The specimens shall then be removed from the water, the surface water wiped off with a damp cloth and the specimens weighed. The percentage of absorption is the difference in weight divided by the dry weight of the specimen and multiplied by 100.
9. Specimens for strength test shall be dried at a temperature of between 215° F. and 225° F. until the loss in weight is not more than 0.1% in two hours of drying.
10. If bearing surfaces of specimens for strength test are not smooth, they shall be made so by grinding. If they cannot be ground to a smooth surface they shall be capped with a mixture of ½ part portland cement and ½ part plaster of paris, which shall be allowed to harden at least 5 hours before the test. The cap shall be formed by spreading the capping material upon a plate glass and pressing the specimen firmly on it, making the cap as thin as possible.
11. Load shall be applied through a spherical bearing block placed on top of the specimen in a vertical testing machine. The dimensions of the bearing block shall be the same, or slightly larger, than those of the test specimen.
12. Load shall be applied uniformly and without shock. The speed of the moving head of the machine shall be not more than .05 of an inch per minute when the machine is running idle.
13. Specimen shall be loaded to failure and the unit compressive strength calculated in pounds per square inch. The type of failure and appearance of specimen shall be noted.

AVERY CLASSICS

The Cast Stone Institute is an organization of cast stone manufacturers formed for the purpose of improving the quality of cast stone and of disseminating information regarding its use. The activities of the Institute are designed to benefit both the industry and its patrons.

The Institute solicits the cooperation of architects and users of cast stone. It invites requests for information and assistance in matters involving cast stone.

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